



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/673,581	09/30/2003	Ji-Soo Kim	SEC.745C	1609

7590 06/02/2005  
VOLENTINE FRANCOS, PLLC  
SUITE 150  
12200 SUNRISE VALLEY DRIVE  
RESTON, VA 20191

EXAMINER

FERNANDEZ, KALIMAH

ART UNIT PAPER NUMBER

2881

DATE MAILED: 06/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/673,581

Applicant(s)

KIM ET AL.

Examiner

Kalimah Fernandez

Art Unit

2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 February 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 9-14 and 21-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 9-14 and 21-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                                        |                                                                                         |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____                                                |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 9 is rejected under 35 U.S.C. 102(b) as being anticipated by US Pat No 5,594,245 issued to Todokoro et al.
3. Todokoro et al disclose a method of determining whether a conductive wafer is exposed through a contact hole that is formed in an overlying layer by a plasma process (see for example col.2, line 41- col.3, line 18; col.3, line 65-col. 4, line 5). Specifically, Todokoro et al disclose the capability to observe both surface and internal structure with or without the presence of contact holes (see also col. 12, lines 20-58; col.28, lines 35-67).
4. Todokoro et al disclose repeatedly scanning an inside of a contact hole with a beam of primary electrons (see for example col.14, lines 22-45; col.16, lines 48-53).

5. Todokoro et al disclose collecting secondary electrons that are generated by a reaction between the primary electron beam and an inside surface of the contact hole and that are emitted from the contact hole (col.12, line 59- col.13, line 30).
6. Todokoro et al implicitly disclose determining whether a surface of the conductive layer is exposed through the contact hole in the insulating layer pattern based on a change in an amount of collected secondary electrons (col.12, lines 20-46). Todokoro et al disclose the ability to determine the composition of both the surface and bottom of a contact hole by the change of the collected secondary electron. Therefore, Todokoro et al discloses the ability to determine whether a conductive layer is exposed as claimed.

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 10-14 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Pat No 5,594,245 issued to Todokoro et al and US Pat No US 6,066,849 issued to Masnaghetti et al.
3. Todokoro et al teach the claimed invention except for counting number of scans for data processing purpose.
4. However, Masnaghetti et al teaches repeatedly scanning an inside of the contact hole with a beam of primary electrons (col.9, lines 41-57; see figs.6c-d).
5. It would have been obvious to an ordinary artisan at the time of the invention to combine Todokoro et al and Masnaghetti et al because Masnaghetti et al teach improve image resolution (see for example col.1, line 66- col. 2, line 15).
6. An ordinary artisan would have found obvious motivation to combine the teachings flowing from Masnaghetti's ability to maintain a specific charge level on an area, including multiplexing a contact hole (col.8, lines 63-68; col.9, lines 41-68).
7. As per claim 10, Todokoro et al teach a gate electrode, wherein the disclosure of undersurface wiring pattern embodies a gate electrode (col.20, lines 9-28).

8. As per claim 11, Masnaghetti et al teach repeatedly scans the predetermined region of the surface of the wafer with the primary electron beam (col.5, lines 55-68). Masnaghetti et al teach the pulsing of the electron beam (see figs. 3a-d; col.6, lines 48-68). Masnaghetti et al teach counting the number of scans (col.7, lines 15-20).

9. As per claims 12-14 and 21-23, Todokoro et al teach scanning an inside of a contact hole (col.28, line 49-col.29, line 13). Masnaghetti et al teach counting the number of scans (col.7, lines 15-20). The difference between the claimed invention and the prior art is "determining whether a surface of the conductive layer is exposed through the contact hole in the insulating layer pattern based on a change in an amount of collected secondary electrons as a function of the N scans."

10. The recited analytical method, wherein any change in detected secondary electrons is represented with respect to the number of scan, falls within the level of ordinary skill, because it is widely known in the art to compare multiple image scans to determine differences among images (or scans) as illustrated by Todokoro (see col.29, lines 1-9).

11. It would have been obvious to an ordinary artisan at the time of the invention to modify the combined references---Todokoro et al and

Masnaghetti et al, since the number of scans is an obvious variable that achieves a art-recognized result, wherein the number of scans is directly related to the number of collected images. Todokoro et al describe the comparison of numerous signals and that this comparison reveals depth and material differences.

12. Likewise, it would have been obvious to an ordinary artisan to isolate the peak position among the scans as recited in claim 22, since this peak represents an obvious point of interest--- the bottom of a contact hole, which can be compared to a reference to determine the conductive layer's presence (see for example col.26, lines 46-56). Obvious motivation for this modification flows from the combination of Todokoro et al and Masnaghetti et al, because signal comparison is typical as illustrated in col.19, lines 30-37 of Todokoro et al. (See also col.21, lines 25-40).

13. Lastly, the difference with the prior art and claimed invention recited in claims 12-14 is "providing a sample graph which shows the change in the amount of collected secondary electrons with respect to a number of scans of primary electrons; providing a reference graph which shows a change in the amount of secondary electrons detected in a standard state where the conductive layer is exposed with respect to a number of scans of

primary electrons; and determining whether the conductive layer is exposed by comparing a waveform of the sample graph to a waveform of the reference graph." As stated above, the limitation is obvious modification of the combined references--- Todokoro et al and Masnaghetti et al, wherein the claimed invention merely utilizes a data processing method that falls within the level of skill in the art.

### ***Response to Arguments***

14. Applicant's arguments filed 2-22-05 have been fully considered but they are not persuasive. Applicant argues three major points: 1) Todokoro et al does not collect secondary electrons that are generated by a reaction between the primary electron beam and an inside surface of the contact hole; 2) the cited text does not teach determining whether a surface of the conductive layer; and 3) the obvious combination of Todokoro and Masnaghetti fails to teach the elements of claim 21. Each will be addressed in turn.

**Proper claim interpretation renders the contact-hole inspection limitation anticipated by Todokoro et al.**



15. MPEP 2111 requires all claims be given their broadest reasonable interpretation. MPEP 2111.01 also instructs claim language be given its plain meaning unless an applicant's specification expresses a clear intent to define a claim term. The scope of a claim is assessed in light of the level of ordinary skill in the art and a fair reading of the specification. It is also well established anticipation does not require identical terminology. (See MPEP 2131). Here, applicant contends Todokoro et al does not collect secondary electrons that are generated by a reaction between the primary electron beam and an inside surface of the contact hole.

16. Todokoro et al states his invention solves the problem of inspecting through-holes (see col.1, lines 32-42). In col. 24, lines 32-40, Todokoro et al disclose the observation of the internal dimensions of a hole. Applicant admits in his reply (pg. 4, lines 5-7) " Todokoro is exclusively concerned with ... the secondary electrons generated by reflection electrons from the bottom of a hole." Finally, Todokoro et al states explicitly that his invention inspects contact holes (see col.28, lines 34-67); thus, applicant's argument is unpersuasive.

**The conductive-layer determination step is an implicit feature of  
Todokoro et al device.**

17. First, it is well established that it is the claim language that defines a patentable invention. A patentability determination requires a proper assessment of the scope of the presented claims. " This is so because the claims define the scope of the right to exclude; the claim construction inquiry, therefore, begins and ends in all cases with the actual words of the claim." (quoting *Renishaw plc v. Marposs Societa' ner Azioni*, 48 USPQ 2d 1117, 1120). Here, applicant asserts "applicants respectfully submit that the cited text does not make any mention of: (1) any conductive layer at all; (2) determining any composition of a bottom of a contact hole; (3) determining anything at all from any change in the amount of collected secondary electrons."

18. The presented claim 1 recites" determining whether a surface of the conductive layer is exposed through the contact hole in the insulating layer pattern based on a change in an amount of collected secondary electrons." It does not require 'determining any composition of a bottom of a contact hole.' Likewise, a fair reading of applicant's specification fails to support the contention that the composition of hole's bottom is required to

determine whether a conductive layer is present (see for example pg.14. lines 5-23 of applicant's specification).

19. Second, implicit features in a prior art device may be relied upon to satisfy the strict test of anticipation. Todokoro et al implicitly disclose determining whether a conductive layer is present, because Todokoro et al describes performing observation to determine residues commonly used in semiconductor devices (col.1, lines 15-20). Conductive layers are notoriously old in the semiconductor device. Todokoro et al also describes that electron beam energy relates to hole depth and material present in col.12, lines 20-46 (see also col.8, lines 1-5). Todokoro et al discloses the process in col.12, lines 20-46 used for highly integrated semiconductor devices (see col.14, lines 45-59). Todokoro discloses, in addition, the inspection of exposed wiring patterns (see col.29, lines 14-27). These disclosures, in the context of Todokoro et al stated problem, leads to the conclusion that hole inspection as taught would necessarily include information regarding any conductive layer, if present. Therefore, although Todokoro does not explicitly recognize the recited limitation, it is implicit that inspecting a hole having a conductive layer via Todokoro's device

would necessarily yield information about whether a conductive-layer is present from the change in an amount of collected secondary electrons.

**The obvious combination of Todokoro et al and Masnaghetti et al teaches the limitations of claims 12-14 and 21.**

20. A proper obviousness determination considers four factors: 1) the scope and content of prior art; 2) the level of ordinary skill in the art; 3) differences between the claimed invention and the prior art; and 4) the objective evidence of nonobviousness.

21. Todokoro teaches inspecting holes and implicitly teach determining whether a conductor layer is present as discussed above. Masnaghetti et al also teach contact-hole inspection. Masnaghetti illustrates an improvement upon Todokoro's disclosure, because Masnaghetti seeks to improve image resolution by multiplexing beam conditions. As stated in the rejection, Masnaghetti et al teach repeatedly scans the predetermined region of the surface of the wafer with the primary electron beam (col.5, lines 55-68). Masnaghetti et al teach the pulsing of the electron beam (see figs. 3a-d; col.6, lines 48-68). Masnaghetti et al teach counting the number of scans (col.7, lines 15-20).

22. The difference between claim 21 and the cited art is “determining whether a surface of the conductive layer is exposed through the contact hole in the insulating layer pattern based on a change in an amount of collected secondary electrons as a function of the N scans.”

23. The appropriate inquiry then is whether the difference between the claimed invention and prior art is made evident by the prior art given the level of ordinary skill in the art. Namely, the test of obviousness is not the specific disclosures, but what the combination suggests to an ordinary artisan.

24. Here, plotting any change in detected secondary electrons with respect to the number of scan falls within the level of ordinary skill, because it is widely known in the art to compare multiple image scans to determine differences among images (or scans). This method is taught in Todokoro (see col.29, lines 1-9). From this disclosure, an ordinary artisan would have obvious motivation to analyze the detected secondary electrons with respect to N scans.

25. Similarly, the recited analytical method in claims 12-14 is an obvious modification of the combined references.

***Conclusion***

26. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kalimah Fernandez whose telephone number is 571-272-2470. The examiner can normally be reached on Mon-Tues 6:30-3:30; Wed-Thurs 8-5 and Fri.9am-6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on 571-272-2477. The

fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KF

  
JOHN R. LEE  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800